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(54) Title: COMPUTERIZED PAYMENT SYSTEM FOR PURCHASING GOODS AND SERVICES ON THE INTERNET		
(57) Abstract <p>A method and system for use on a quasi-public network, such as the Internet, to enable users of the network to conduct commercial transactions involving a payment of funds by one user to another user of the network. The method includes operating a computer system for sending and receiving messages from users over the network. Upon receiving a message over the network from a qualified user-seller, a message is sent over the network to the user-buyer that was identified in the message from the user-seller. The message to the user-buyer requests confirmation of a transaction identified in the message received from the user-seller. Upon receiving a confirmation over the network from the user-buyer, payment information is sent by secure channels off the network to an agent of the user-seller. The user-seller's agent may be a separate entity or the function of the user-seller's agent may be performed by the transaction enabling system. Upon receipt of an authorization code from the seller's agent, the authorization code is encrypted and sent to the user-seller over the network.</p>		

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1 COMPUTERIZED PAYMENT SYSTEM
2 FOR PURCHASING GOODS AND SERVICES
3 ON THE INTERNET

4 REFERENCE TO RELATED APPLICATION

5 This application is related to copending
6 application Serial No. 08/308,101, filed September 16,
7 1994, the entire disclosure of which is hereby
8 incorporated by reference herein.

9 BACKGROUND OF THE INVENTION

10 The present invention relates to a system for
11 enabling payment for goods and services over a quasi-
12 public network, and more particularly, the present
13 invention relates to a payment system that can be used to
14 enable an Internet user to initiate a payment to another
15 Internet user for goods or services over the Internet.

16 The Internet has emerged as a large community
17 of electronically-connected users located around the
18 world who readily and regularly exchange significant
19 amounts of information. The Internet continues to serve
20 its original purposes of providing for access and
21 exchange of information among government agencies,
22 laboratories, and universities for research and
23 education. In addition, the Internet has evolved to
24 serve a variety of interests and forums that extend
25 beyond its original goals.

26 The Internet has been considered as a potential
27 new marketplace for various types of products, including
28 goods and services. Using the Internet as a marketplace
29 has many advantages. Although the Internet presently has
30 the capability to serve as a marketplace for goods and
31 services, use of the Internet for this purpose has been
32 slow to develop. One reason for this lack of development
33 is that it is difficult to pay for goods or services
34 using the Internet. An Internet user cannot send cash or
35 a check via the Internet. Sending a check via physical

1 delivery services is slow and sending a credit card
2 number over the Internet poses security problems.

3 In the aforementioned patent application,
4 Serial No. 08/308,101, there was disclosed a payment
5 system that enabled payment on a quasi-public system,
6 such as the Internet. The payment system described in
7 the referenced application is useful for enabling payment
8 for a variety of products and services, especially for
9 information products that can be delivered electronically
10 over the network without physical packaging. Information
11 products include software, stories, cartoons, recipes,
12 etc.

13 The aforementioned payment system has proven
14 successful. However, there continues to be a need for a
15 payment system for users of the Internet who have
16 products to vend. Such products include goods and
17 services that could be as diverse as clothing, computer
18 hardware, technical support and advice, groceries,
19 educational courses and training, etc. These types of
20 goods and services are not necessarily capable of being
21 transmitted electronically over the network. Such
22 products may also include information products, as
23 described above. Since the Internet provides a medium
24 for users who have all these types of products to sell to
25 reach users who have an interest in purchasing these
26 types of products, it would be advantageous if a system
27 were available for willing users to enter into
28 transactions with other users for the purchase of these
29 goods and services.

30 Accordingly, there is a need for a system that
31 enables users of the Internet to enter into commercial
32 transactions for goods and services.

33 SUMMARY OF THE INVENTION

34 According to a first embodiment of the present
35 invention, there are provided a method and payment system
36 for use on a quasi-public network, such as the Internet,

1 to enable users of the network to conduct commercial
2 transactions involving a payment of funds by one user to
3 another user of the network. The embodiment includes
4 operation of a computer system for sending and receiving
5 messages from users over the network. Upon receiving a
6 message over the network from a qualified user-seller, a
7 message is sent over the network to the user-buyer that
8 was identified in the message from the user-seller. The
9 message to the user-buyer requests confirmation of a
10 transaction identified in the message received from the
11 user-seller. Upon receiving a confirmation over the
12 network from the user-buyer, payment information is sent
13 by secure channels off the network to an agent of the
14 user-seller. Upon receipt of an authorization code from
15 the seller's agent, the authorization code is
16 cryptographically signed and sent to the user-seller over
17 the network.

18 BRIEF DESCRIPTION OF THE DRAWINGS

19 Figure 1 is a block diagram illustrating a
20 payment system according to a first embodiment of the
21 present invention.

22 Figure 2 is a block diagram of a hardware
23 configuration for the payment system of Figure 1.

24 Figure 3 is a block diagram of the program
25 arrangement of the payment system of Figure 1.

26 Figure 4A is a diagram of the data fields for a
27 buyer's cardholder account for use with the payment
28 system of Figure 1.

29 Figure 4B is a diagram of the data fields for a
30 seller's account for use with the payment system of
31 Figure 1.

32 Figure 5 is a flow chart showing message flow
33 for an payment request using the payment system of
34 Figure 1.

35 Figures 6A-6F are diagrams of data messages
36 used in connection with the payment system of Figure 1.

1 Figure 7 is a flow chart showing the message
2 flow for an payment query and a payment response using
3 the payment system of Figure 1.

4 Figure 8 is a flow chart showing the message
5 flow using the payment system of Figure 1 for
6 communication with the seller's agent.

7 Figure 9 is a flow chart showing the message
8 flow for sending an encrypted authorization code to the
9 seller using the payment system of Figure 1.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

11 I. OVERALL SYSTEM

12 Figure 1 shows a block diagram of a first
13 embodiment of the present invention for a payment
14 system 10. The payment system 10 is shown in relation to
15 the Internet network 12. The Internet network 12 is a
16 large, quasi-public network having many users 14. The
17 Internet network 12 is of a type that the users 14 can
18 access by various means such as dedicated communication
19 links or conventional commercial telephone systems. The
20 Internet network 12 provides numerous services for its
21 users such as e-mail, FTP, and the World Wide Web (WWW).
22 Although the payment system 10 is specifically useful for
23 the Internet, it may be used in conjunction with other
24 having a plurality of users that can communicate with
25 each other by e-mail.

26 In the embodiment of Figure 1, one of the users
27 14 (designated as a buyer 20) wishes to acquire goods or
28 services 26 from another of the users (designated as a
29 seller 28). The seller 28 may be any user with a product
30 or service to vend. The goods or services may include
31 anything that can be sold for value, such as clothing,
32 appliances, computers, automobiles, technical advice,
33 consulting, and so on. The goods or services may also
34 include information products that can be transferred
35 electronically over a network, such as the Internet.

1 The seller 28 wishes to sell goods or services
2 26 to the buyer 20 at a price. The price may be an
3 advertised price (e.g. advertised over the Internet, on a
4 bulletin board, or other media), or may be a negotiated
5 price (e.g. negotiated via message or e-mail exchange
6 over the Internet). Although the example of Figure 1
7 describes one seller 28 and one buyer 20, the payment
8 system 10 is understood to extend to include multiple
9 buyers of one seller, multiple sellers to one buyer, and
10 multiple sellers and multiple buyers. Also, a buyer or a
11 seller may be an individual, a company, or an
12 institution.

13 Also shown in Figure 1 is a financial
14 transaction settlement system 30. The financial
15 transaction settlement system 30 represents presently-
16 available commercial institutions that process credit and
17 other financial transactions. For example, the financial
18 transaction settlement system 30 may represent
19 commercially available credit card processing
20 institutions (e.g. Visa, Master Card, Discover, and so
21 on). The financial transaction settlement system 30
22 includes two components: an issuer 32 and an acquirer 34.
23 The issuer 32 includes banks, or other institutions, that
24 issue credit cards to persons, send statements and bills
25 to credit card holders on a regular basis, and collect
26 payment from the credit card holders. These functions
27 are not performed on the Internet but use conventional
28 mail delivery, authorized direct withdrawals from bank
29 accounts, etc.

30 The payment system 10 of the present embodiment
31 utilizes these commercially available issuers 32 to bill
32 users and to collect payment from users for their
33 transactions on the Internet 12 using the payment system
34 10. For example, a user's transactions that are
35 initiated using the payment system 10 would show up on
36 the user's credit card statement as a charge from the
37 seller 28.

1 As mentioned above, the financial transaction
2 settlement system 30 also includes the acquirer component
3 34. This acquirer component 34 includes banks or other
4 institutions that provide merchant accounts for entities
5 that want to receive payment for the sale of goods or
6 services. These merchant accounts are similar or
7 identical to the conventional merchant accounts that are
8 provided to businesses. As mentioned below, the acquirer
9 34 processes the user charges received from the payment
10 system 10 and passes this information to the issuer
11 component 32 for the preparation and sending of monthly
12 statements and bills to users and collecting payment from
13 users.

14 The payment system 10 includes two distinct
15 parts or systems: an above-the-line system 40 and a
16 below-the-line system 42. The above-the-line system 40
17 and the below-the-line system 42 are separated by a
18 "line" or "firewall" 44. The line 44 isolates the above-
19 the-line system 40 from the below-the-line system 42.
20 The line 44 permits limited communication between the
21 above-the-line system 40 and the below-the-line system 42
22 but prevents unauthorized access to the below-the-line
23 system 42 through the above-the-line system 40. The line
24 44 provides security for the information contained on the
25 below-the-line system 42 and prevents hackers on the
26 Internet from entering the below-the-line system 42 via
27 the above-the-line system 40.

28 Figure 2 is a block diagram illustrating one
29 possible configuration of hardware components used to
30 implement the payment system 10 of Figure 1. The above-
31 the-line system 40 includes an above-the-line (or "front
32 end") computer 50 and the below-the-line system 42
33 includes a below-the-line (or "back end") computer 52.
34 The above-the-line computer 50 and the below-the-line
35 computer 52 are connected together via a private network
36 53. In a preferred embodiment, the private network is an
37 Ethernet network. The above-the-line computer 50

1 includes an above-the-line system board 54 associated
2 with an above-the-line memory 56, a storage device 58
3 such as a fixed disk drive, a back up tape drive 60, a
4 removable media drive 62, a monitor 64, and a power
5 supply 66. The above-the-line computer 50 is connected
6 to the Internet 12 by means of a leased T1 line 69.

7 The below-the-line computer 52 includes a
8 below-the-line computer system board 68 associated with a
9 below-the-line computer memory 70, a below-the-line
10 computer storage device 72 such as a fixed disk drive, a
11 back up tape drive 74, a removable media drive 76, a
12 monitor 78, and a power supply 80. The below-the-line
13 computer 52 is connected to the above-the-line computer
14 50 by means of Ethernet cable. The below-the-line
15 computer 52 also has a Novell LAN 81 that provides a
16 secure communication link apart from the Internet.

17 Both the above-the-line computer 50 and the
18 below-the-line computer 52 in this embodiment are
19 preferably commercially available Sun Microsystems SS1000
20 computers. Preferably, both the above-the-line computer
21 50 and the below-the-line computer 52 are equipped with
22 64 MB memory. As mentioned above, the dedicated private
23 network is an Ethernet and includes a SBus host adaptor.
24 The communication server is a Sun Microsystems
25 SPARCserver 1000. Both the above-the-line monitor 64 and
26 the below-the-line monitor 78 are commercially available
27 Sun 17 inch monitors. The above-the-line and below-the-
28 line tape drives are Python 5GB tape drives using 4mm
29 tape available from Sony, Inc. The above-the-line disk
30 drive 58 and the below-the-line disk drive 72 are
31 commercially available Seagate 1.7GB disk drives. The
32 host adaptor is a Sun Microsystems SBus host adaptor.
33 The network server is a commercially available Sun
34 Microsystems SSarray 101. The above-the-line and below-
35 the-line computers 50 and 52 may be similar or identical
36 to the front end and back end computers that are

1 described in the aforementioned related patent
2 application Ser. No. 08/308,101.

3 Referring to Figure 3, the above-the-line
4 computer 50 runs an above-the-line program 90. The
5 above-the-line program 90 is a software program that
6 provides for communication with users 14 on the Internet
7 12. Specifically, the above-the-line program 90 includes
8 modules that can be accessed and used by Internet users
9 who are buyers 20 and Internet users who are sellers 28.

10 The below-the-line computer 52 runs a below-
11 the-line program 92. The above-the-line program 90
12 communicates with the below-the-line program 92 via the
13 private network 53. Thus, the above-the-line program 90
14 is physically separate and isolated from the below-the-
15 line program 92. The below-the-line program 92 receives
16 information from and sends information to the above-the-
17 line program 90 by means of batch processing. This
18 comprises, in part, the firewall or line 44 and results
19 in an inherently safe method of communicating between the
20 publicly accessible part of the payment system, i.e. the
21 above-the-line system 40, and the secure part of the
22 payment system, i.e. the below-the-line system 42.

23 To access the above-the-line program 90 over
24 the Internet, users 14 who are buyers may use a user
25 interface software program 118 that can be run on their
26 own computers for interactive access, or alternatively,
27 users 14 may access the payment system 90 via
28 conventional e-mail programs, for store-and-forward
29 access. Similarly, users who are sellers 28 may access
30 the above-the-line program 90 over the Internet, by
31 running an interface software program 119 on their own
32 computers for interactive access, or alternatively, may
33 access the payment system 10 via conventional e-mail
34 program. Programs 90, 118, and 119 may be written in any
35 suitable programming language, such as Tcl or C. The
36 software modules are capable of being used with the UNIX

1 operating system, DOS, and may be ported to various other
2 operating systems.

3 II. ESTABLISHING BUYERS AND SELLERS ACCOUNTS

4 In order for a user of the Internet to use the
5 payment system 10 for transactions as a buyer, the user
6 obtains a subscriber (or cardholder) account 100 with the
7 payment system 10. The buyer's cardholder account may be
8 similar or identical to the cardholder account described
9 in the related patent application. In order for a user
10 of the Internet to use the payment system 10 for
11 transactions as a seller, the user obtains a seller's
12 account 200 with the payment system 10. Each user may
13 arrange with the payment system 10 individually to set up
14 appropriate accounts, or alternatively, a bank may make
15 arrangements with the payment system 10 to provide
16 appropriate accounts to a large number of the bank's
17 customers, such as its credit card customers, as a
18 enhancement or a promotion. The characteristics of the
19 buyer's and seller's accounts are set forth as follows:

20 A. The buyers' accounts

21 Referring to Figure 4A, there is depicted a
22 representation of the data in a buyer's cardholder
23 account 100. The buyer's cardholder account 100 includes
24 the following information: a cardnumber 102, the
25 cardholder's name 103, the cardholder's Internet e-mail
26 address 104, a state 106, and a pay-in selection 108.
27 These items are explained below. In addition, the
28 cardholder account 100 may include additional
29 information, such as a pay-out selection and a currency
30 preference 112, as disclosed in the aforementioned patent
31 application.

32 The cardnumber 102 uniquely identifies the
33 cardholder account 100. The cardnumber 102 is an
34 alphanumeric string that is easily typed and read by
35 a human. Also, the cardnumber 102 is relatively hard to

1 guess and bears no deducible relationship to any
2 financial artifact, such as a credit cardnumber,
3 a checking account number, nor to any e-mail address.

4 The cardholder's name 103 is the cardholder's
5 actual name, business name, or an alias.

6 The cardholder Internet e-mail address 104 is
7 the e-mail address of the cardholder that is unique for
8 each user of the Internet.

9 The state 106 is one of "active", "suspended",
10 or "invalid."

11 The pay-in selection 108 is how the cardholder
12 transfers funds, i.e. makes payment, for use with the
13 payment system 10. Typically, this may be done by using
14 a conventional authorization to charge a credit card.
15 The pay-in selection is not encoded in nor directly
16 derivable from the cardnumber.

17 Users of the Internet who wish to use the
18 payment system 10 for the purchase of goods or services
19 over the Internet may obtain cardholder or subscriber
20 accounts as described in the aforementioned patent
21 application, or by making an application to First Virtual
22 at its web site.

23 B. The sellers' accounts

24 Users of the Internet who wish to use the
25 payment system 10 as sellers need to be qualified.
26 Sellers are qualified by establishing a relationship with
27 an acquiring bank 34 that underwrites the seller 28 for
28 credit worthiness and that provides the seller 28 with a
29 merchant account. As shown in Figure 1, an acquiring
30 bank 34 is part of the settlement system 30.
31 Establishing a merchant account enables the seller 28 to
32 act as a merchant and accept credit cards (or credit card
33 numbers) for payment for goods and services.

34 Referring to Figure 1, when a user becomes
35 qualified as a seller, the user also establishes a
36 relationship with a seller's agent 115. The seller's

1 agent 115 is a bank card processor that interacts with
2 the credit card bureaus 117 such as Visa, Master Card,
3 etc., that are part of the settlement system 30. The
4 seller's agent 115 performs the functions of credit card
5 authorizations and chargebacks. Companies that are now
6 performing these services include EDS and FDR. For
7 example, in a conventional credit card transaction at an
8 retail outlet, after a customer presents a credit card
9 for payment, the clerk passes the card through a card
10 reader that makes a call to a bank card processing
11 company for authorization. The call from the card reader
12 identifies the card number and the amount of sale. If
13 the credit card is valid and the amount is within the
14 credit limits of the card, the seller's agent 117
15 responds with an authorization code. In the context of
16 the present embodiment of the payment system, it is
17 intended that sellers' agents 115 will perform similar
18 functions as they do now with respect to conventional
19 credit card transactions. There may be many seller's
20 agents associated with different sellers, or many of the
21 sellers may use the same agent. In an alternative
22 embodiment, the payment system 10 may perform the
23 function of seller's agent.

24 As mentioned above, a user of the Internet who
25 wishes to use the payment system 10 to obtain payment for
26 transactions as a seller of goods or services obtains a
27 seller's account 200 with the payment system 10.
28 Referring to Figure 4B, the seller's account 200 includes
29 the following data: a seller's account cardnumber 202,
30 the seller's name 203, the seller's Internet e-mail
31 address 204, and a state 206. These data are similar to
32 the data in the buyer's cardholder account 100. The
33 seller's account 200 includes at least one additional
34 item of data that is not included in the buyer's
35 cardholder account, that is, the seller's account 200
36 includes a seller's agent number 219. In addition, the
37 seller's account may include other information.

1 Referring again to Figure 3, the buyer
2 cardholder account and seller account information is
3 distributed in the payment system 10. Only a portion of
4 the buyer cardholder account and seller account
5 information resides in the above-the-line system 40 where
6 it is accessible by the above-the-line program 90.
7 However, full copies of all the buyers' cardholder and
8 sellers' account information reside on the below-the-line
9 system 42 where it is accessible by the below-the-line
10 program 92. Specifically, the parts of the subscriber
11 and seller account information that reside on the above-
12 the-line computer 50 are located in one or more data
13 files 91 stored on the above-the-line computer storage
14 device 58. The subscriber and seller account information
15 that resides on the below-the-line computer 52 is located
16 in one or more data files 114 stored on the below-the-
17 line computer storage device 72. The above-the-line
18 program 90 operates with the database file 91 that is
19 stored on the above-the-line storage 58 and the below-
20 the-line program 92 operates with the database file 114
21 located on the below-the-line storage 72.

22 The items of information in the buyer
23 cardholder account located in the file 91 on the above-
24 the-line computer 50 include the subscriber account
25 number 102, the cardholder's name 103, the Internet
26 e-mail address information 104, and the state 106.
27 However, the above-the-line computer 50 does not contain
28 any of the pay-in 108 information, such as credit card
29 information, etc., associated with the buyer-subscriber.
30 Credit card or other payment information is located only
31 in the data file 114 located on the storage device 72 of
32 the below-the-line system 42. Similarly, the items of
33 information in the seller's account 200 located on the
34 above-the-line system 40 include the seller's account
35 number 202, the seller's name 203, the seller's Internet
36 e-mail address information 204, and the state 206 of the
37 seller's account. However, the above-the-line system 40

1 does not contain the seller's agent number 219. This
2 information is located only in the data file 114 on the
3 storage device 72 of below-the-line computer 52.

4 III. METHODS OF OPERATION OF THE PAYMENT SYSTEM

5 As mentioned above, the payment system 10
6 provides users of the Internet with a means for
7 initiating a payment transaction, and in particular, a
8 means for payment for goods or services.

9 It is assumed for purposes of the operation of
10 the embodiment described herein that the Internet user
11 who wants to make a payment has already established a
12 buyer's cardholder account with the payment system, as
13 described above. Further, it is assumed that the
14 Internet user who wants to receive payments has
15 established a seller's account with the payment system,
16 as described above.

17 Referring to Figure 5, an Internet user (i.e.
18 the buyer 20) becomes aware of goods or services that the
19 seller 28 has to vend. This may occur in many different
20 ways. For example, the buyer 20 may be searching on the
21 Internet for a seller of the particular product or
22 service. Alternatively, the buyer 20 may be "browsing"
23 and happen upon the seller's page. Also, the seller 28
24 may send messages to a class of Internet users to inform
25 them of the goods or services that it has to sell. The
26 buyer 20 may be aware of the seller 28 via advertising,
27 on the Internet or other media, through others, from a
28 bulletin board, from a product warehouse on the Internet,
29 or any other means.

30 The buyer 20 becomes interested in the goods or
31 services that the seller 28 has to vend and then the
32 buyer 20 may contact the seller 28 by sending a message
33 to the seller's Internet address or by an interactive
34 protocol, e.g. the World Wide Web, FTP, etc. The means
35 to contact the seller, e.g. the seller's e-mail address
36 or Web site address, may be included in advertising, etc.

1 The buyer 20 and the seller 28 may partake in an exchange
2 of messages 107 over the Internet before the buyer 20
3 decides to purchase the goods or services from the seller
4 28. For example, the buyer 20 may send messages to the
5 seller 28 to inquire about product availability,
6 specifications, options, support, etc. The seller 28 may
7 respond with appropriate messages over the Internet in
8 reply to the buyer's inquiries. Also, the buyer and
9 seller may exchange messages to negotiate a price for the
10 goods or services. In addition, if the goods or services
11 that the seller wants to sell are of a type that require
12 a physical delivery, the buyer and seller may make
13 appropriate arrangements for such delivery by message
14 exchange over the Internet.

15 When the buyer 20 decides to buy the goods or
16 services, the buyer 20 informs the seller 28 of the
17 buyer's cardnumber 102 by providing an appropriate
18 message 128 over the Internet 12. The information
19 included in the buyer's message 128 is represented in
20 Figure 6A. The message 128 may take the form of an
21 e-mail message over the Internet 12 that includes the
22 buyer's cardnumber, or alternatively, the buyer 20 may
23 inform the seller of its cardnumber 102 by means of
24 interactive protocols, or by including the cardnumber in
25 a username in a file transferred from the buyer 20 to the
26 seller 28 using the Internet 12, or by other means.

27 Referring again to Figure 5, upon receiving the
28 buyer's message 128 that includes the buyer's cardnumber
29 102, the seller 28 sends an payment-request message 129
30 to the payment system 10 via the Internet 12.
31 Specifically, the seller 28 sends the payment-request
32 message 129 to the above-the-line program 90 on the
33 above-the-line system 40. The payment-request message
34 129 may be sent by either e-mail or by using an
35 interactive protocol on the Internet 12.

36 Referring to Figure 6B, the payment-request
37 message 129 contains the following information: the

1 buyer's cardnumber 102, the seller's cardnumber 202, a
2 textual description 232 of the transaction, an amount
3 234, a merchant's transaction-identifier 236, and any
4 physical delivery 237 information for the purchase.

5 After receiving the payment-request message
6 129, the above-the-line program 90 ascertains whether the
7 payment-request message 129 is from a qualified seller
8 28. This is performed by the above-the-line program 90
9 by checking the database file 91 on the above-the-line
10 system 40. Upon confirmation that the payment-request
11 message 129 is from a qualified seller, the payment
12 system 10 generates a message to ask the buyer 20 whether
13 the buyer 20 wishes to authorize payment for the
14 transaction to the seller 28. Specifically, as shown in
15 Figure 7, the above-the-line program 90 generates
16 an payment-query message 140 to be sent to the buyer 20
17 over the Internet.

18 As shown in Figure 6C, the payment-query
19 message 140 contains the following data: a transaction-
20 identifier 142, the buyer's name 103, the seller's name
21 203, the textual description of the transaction 232, and
22 an amount 235. The transaction-identifier 142 is a
23 number or code uniquely-generated by the above-the-line
24 program 90. Using the information contained in the
25 payment-request message 129 from the seller 28,
26 specifically the buyer's cardnumber 102 and the seller's
27 cardnumber 202, the above-the-line program 90 looks up
28 the buyer's name 103 and the seller's name 203. In the
29 payment-query message 140, the buyer's name 103 and the
30 seller's name 203 are used instead of the buyer's
31 cardnumber 102 and the seller's cardnumber 102 in order
32 to minimize transmission of the cardnumber information
33 over the Internet thereby improving security of the
34 system. The amount 235 sent to the buyer may differ from
35 in the transaction amount 234 received from the seller to
36 account for any currency exchange rates or service
37 charges imposed by the payment system 10.

1 After generating the payment-query message 140,
2 the above-the-line system 40 sends the payment-query
3 message 140 to the buyer's e-mail address and waits for
4 a response from the buyer 20. The payment-query message
5 140 requests the buyer 20 to respond with one of three
6 possible replies: "yes", "no", or "fraud." Thus, there
7 are four possible alternatives that can occur in response
8 to the payment-query message 140, taking into account the
9 three permitted responses by the buyer and the
10 possibility of no reply.

11 **1. No reply from Buyer**

12 If there is no reply from the buyer 20 to the
13 payment-query message 140 after a period of time, the
14 above-the-line system 40 will send the payment-query
15 message 140 again, i.e. a second notice. The above-the-
16 line system 40 may send the payment-query message 140 to
17 the buyer 20 several times until a response from the
18 buyer 20 is obtained. If more than a certain number of
19 days elapses, or more than a certain number of payment-
20 query messages 140 are outstanding to the buyer 20, and
21 the above-the-line system 40 does not receive an
22 appropriate response from the buyer 20, as indicated
23 below, then the above-the-line system 40 causes the
24 buyer's cardholder account 100 to become suspended. This
25 is done by changing the buyer's cardholder state 106 from
26 "active" to "suspended." The buyer's account 100 may be
27 reinstated later if an appropriate response is received
28 and/or the number of outstanding payment-query messages
29 140 for the buyer 20 drops to less than a certain
30 threshold. Upon reinstatement, the buyer's account 100
31 is returned to an "active" state. Further, any
32 outstanding payment-query messages 140 may be sent again
33 some time later.

1 2. Buyer responds "no"

2 Referring to Figure 7, in response to the
3 payment-query message 140, the buyer 20 may respond by
4 sending a payment-response message 150 to the above-the-
5 line system 40 via the Internet 12. As illustrated in
6 Figure 6D, the payment-response message 150 contains the
7 following data: the payment system generated
8 transaction-identifier 142 and an indication 152 of the
9 buyer's willingness to allow transfer of funds. The
10 willingness indication 152 is one of "yes", "no", or
11 "fraud."

12 The structure of the payment-query message 140
13 facilitates preparation of the payment-response message
14 150 by the buyer 20. In the payment-query message 140,
15 the transaction-identifier 142 is placed in the "subject"
16 of the payment-query message 140 and the e-mail address
17 to which the buyer's payment-response message 150 should
18 be sent (e.g. "response@card.com") is placed in the
19 "sender's address" of the payment-query message 140.
20 Many conventional e-mail programs in use on the Internet,
21 including many older programs, have a feature that will
22 automatically read the "subject" and "sender's address"
23 of a received message and format a reply message directed
24 to the sender's address with the same "subject" as the
25 received message. If the buyer 20 uses this common
26 feature to send his payment-response message 150 back to
27 the payment system 10, the only information that the
28 buyer 20 will have to add is the willingness indication
29 152 which is only a one word or one letter reply, (i.e.,
30 "yes", "no", or "fraud", or "Y", "N", or "F").

31 If the buyer 20 replies "no" in the willingness
32 indicator 152, the above-the-line system 40 sends a
33 payment-result 160 to the seller 28 with a "no"
34 indication 152. The format of a payment-result message
35 160 is shown in Figure 6E. A payment-result message 160
36 contains the following information: the transaction-
37 identifier 142, the seller's name 203, the buyer's name

1 103, the textual description of the transaction 232, the
2 amount 235, the negative indication 152 of the buyer's
3 willingness to allow transfer of funds, and the seller's
4 transaction-identifier 236 if present in the originating
5 payment-request message 129. Optionally, the original
6 transaction amount 234 may also be included. When a
7 buyer declines to authorize payment, a service charge may
8 be generated to the buyer 20 by the payment system.

9 Information regarding the buyer's "no" reply in
10 the payment-response 150 is delivered from the above-the-
11 line program 90 to the below-the-line program 92 where a
12 service charge may be added to a settlement queue for the
13 buyer 20, as discussed in the related application.
14 Further, if a "no" indication is received more than
15 a certain number of times in a certain number of
16 transactions over a certain time period, then the state
17 106 of buyer's account 100 may become "suspended". This
18 is to prevent a user from making a practice of ordering
19 products without authorizing payment for them. If the
20 buyer's account state 106 becomes suspended, this
21 information is also transmitted by batch processing from
22 the above-the-line program 90 to the below-the-line
23 program 92 so that the cardholder account information on
24 the below-the-line computer 52 conforms to that on the
25 above-the-line computer 50.

26 3. Buyer responds "fraud"

27 Referring again to Figure 7, if the buyer 20
28 responds to the payment-query message 140 by sending a
29 payment-response message 150 to the above-the-line
30 computer 50 via the Internet 12 that indicates "fraud" in
31 the willingness indication 152, the payment system 10
32 changes the state 106 of the buyer's cardholder account
33 100 to "invalid." A response of "fraud" indicates that
34 the buyer 20 did not request the goods or services from
35 the seller 28. The information that the buyer 20
36 responded "fraud" to the willingness indication 152 is

1 transmitted by batch processing from the above-the-line
2 program 90 to the below-the-line program 92 so that the
3 cardholder account information on the below-the-line
4 computer 52 conforms to that on the above-the-line
5 computer 50. If the buyer 20 responds "fraud", an
6 appropriate message is sent to seller 28.

7 **4. Buyer responds "yes"**

8 If, in response to the payment-query message
9 140, the buyer 20 responds by sending a payment-response
10 message 150 to the above-the-line system 40 via the
11 Internet 12 that indicates "yes" in the willingness
12 indication 152, the above-the-line program 90 transfers
13 the transaction information, by batch processing, to the
14 below-the-line system 52. The information communicated
15 from the above-the-line system 50 to the below-the-line
16 system 52 includes the buyer's cardnumber 102, the
17 seller's cardnumber 202, a transaction number 142, the
18 amount of the transaction 235, and any physical delivery
19 information for the purchase.

20 When the below-the-line system 52 receives the
21 information from the above-the-line system 50, it
22 associates the identified buyer's cardnumber 102 with the
23 buyer's payment information. This information is stored
24 in the data file 114 on the below-the-line storage 72.
25 The below-the-line system 42 also associates the seller's
26 account number 202 with the seller's agent number 219
27 which is also stored on the below-the-line system storage
28 72.

29 Next, referring to Figure 8, the below-the-line
30 system 42 communicates with the seller's agent 115
31 associated with the seller's agent number 219. The
32 communication 250 to the seller's agent 115 identifies
33 the seller 203, the transaction amount 235, the buyer's
34 payment information (such as the buyer's credit card
35 number), and any physical delivery information for the
36 purchase. The communication 250 to the seller's agent

1 115 is performed off the Internet on secure communication
2 channels. The communication 250 requests whether the
3 seller's agent 115 will authorize a charge of the
4 indicated amount 235 to the buyer's credit card.

5 If the seller's agent 115 indicates that it
6 will approve the charge, it sends an authorization code
7 260 to the below-the-line system 40. Upon receipt of the
8 authorization code 260, the below-the-line program 92
9 generates a cryptographic signature for the authorization
10 code 260. In a preferred embodiment, public key
11 cryptography is used, such as programs available from
12 RSA, or PGP. For purposes of security, it is very
13 desirable to ensure the authenticity of the sender of the
14 authorization code. Accordingly, public key cryptography
15 is used to authenticate the sender's message (in this
16 case, the message of the payment system 10) and is not
17 necessarily used to prevent someone else from reading the
18 authorization code.

19 The signed authorization code 262 is batch
20 processed across the line 44 from the below-the-line
21 system 42 to the above-the-line system 40. Referring to
22 Figure 9, upon receipt of the encrypted authorization
23 code 262 from the below-the-line system 42, the above-
24 the-line system 40 prepares and sends a payment-
25 notification 264 to seller 28. The payment-notification
26 264 may be a plain text e-mail message that includes the
27 seller's transaction identifier 236 and the
28 cryptographically signed authorization code 262. The
29 information included in the payment-notification message
30 264 is represented in Figure 6F. Upon receipt of the
31 payment-notification 264, the seller 28 can authenticate
32 the authorization code 260 using the public key of the
33 payment system used by the encryption program on the
34 below-the-line system 42. Upon verification of the
35 authenticity of the message 264, the seller 28 can
36 proceed to deliver the goods or services to the buyer 20
37 using whatever arrangements had been previously made.

1 Further processing of the charges to the
2 buyer's credit card account and credits to the seller's
3 merchant account are conducted by the conventional
4 settlement system 30 off the Internet using secure
5 communications channels. This isolates the buyer-seller
6 activity which occurs on the Internet from the financial
7 and credit activity which occurs off the Internet.

8 If the seller's agent 115 accepts the buyer's
9 card, the charge is processed in the conventional way in
10 the credit card system 30 to post the charge to the
11 buyer's credit card in the usual manner by sending the
12 appropriate information to the buyer's credit card issuer
13 32. The buyer's credit card issuer 32 sends the buyer 20
14 a credit card bill, typically via the postal system. The
15 credit card bill lists the charge 235 as an item on the
16 user's credit card bill. The settlement system 30 also
17 arranges to make a payment to the seller 28. This may be
18 a transfer from the acquirer-bank 34 to the seller's bank
19 for direct deposit to the seller's checking account.

20 If the seller's agent 115 refuses to accept the
21 buyer's credit card number, e.g. the credit card is lost,
22 stolen, canceled, expired, or the transaction amount
23 exceeds the card's limit, etc., the seller's agent does
24 not send an authorization code back to the below-the-line
25 system 42. Instead, the seller's agent may send a code
26 indicating refusal of the buyer's card. This information
27 is similarly batch processed to the above-the-line system
28 42 and an appropriate message is sent to the seller 28
29 indicating the lack of authorization. The seller 28 may
30 then refuse to deliver the goods or services to the buyer
31 20, or request another card number.

32 The description previously set forth explains
33 how the payment system can process a charge to the user
34 using the conventional, commercially available credit
35 card system. There may be various modifications of the
36 previously described arrangement that may be utilized.
37 For example, the issuer bank 32 may process a debit to a

1 bank account of the buyer 20 instead of sending a credit
2 card bill. Alternately, the issuer bank 32 may send the
3 buyer a bill (other than a credit card bill) for the
4 accumulated charges.

5 As mentioned above, the function of the
6 seller's agent may be performed by the payment system
7 instead of a separate entity. According to this
8 alternative, instead of communicating the information
9 about the transaction (i.e. the seller, the transaction
10 amount, the buyer's credit card number, physical delivery
11 information, etc.) to a separate party designated by the
12 seller as its agent who in turn replies whether it will
13 approve the transaction, the payment system can perform
14 this function itself. If this function is performed by
15 the payment system, it is performed either on the below-
16 the-line system or on an another entirely separate,
17 secure system. Like a separate seller's agent, the
18 payment system would communicate with the appropriate
19 credit card services to determine whether to authorize
20 the transaction in the amount identified in the
21 communication from the above-the-line system. The
22 payment system would then perform the seller's agent's
23 function of generating an authorization code. Then, as
24 in the above-described embodiment having separate
25 seller's agents, the payment system would generate a
26 cryptographically-signed message including the
27 authorization code, send the message to the above-the-
28 line system, and send the cryptographically-signed
29 message to the seller over the Internet.

30 The payment system described above is
31 particularly advantageous for use on networks that do not
32 have a centralized management authority, such as the
33 Internet. Other such systems include FIDOnet and
34 UUCP/Usenet, although it is recognized that these systems
35 are considered by some to part of or associated with the
36 Internet. The payment system described above could also

1 be used on future versions, generations, etc., of the
2 Internet. The payment system could also be used on
3 centrally managed computer systems, such as America
4 Online, Prodigy, etc.

5 The payment system described above enables
6 Internet users to initiate commercial transactions to buy
7 and sell goods or services over a quasi-public network,
8 such as the Internet, regardless of where the users are
9 located or where the payment system is located. Either
10 the buyer or the seller may be located in the U.S. or
11 outside the U.S. Also, some or all of the payment system
12 components, such as the above-the-line system or the
13 below-the-line system, may be located either in the U.S.
14 or outside the U.S.

15 The foregoing detailed description should be
16 regarded as illustrative rather than limiting and the
17 appended claims including all equivalents are intended to
18 define the scope of the invention.

1 WE CLAIM:

2 1. A method for enabling a seller and a buyer
3 communicating over a quasi-public network to initiate a
4 commercial transaction involving a payment of funds by
5 the buyer to the seller, said method comprising the steps
6 of:

7 receiving a message over the quasi-public network
8 from the seller, the seller's message identifying the
9 buyer and a transaction;

10 sending a message over the quasi-public network to
11 the identified buyer, said message to the buyer
12 identifying the transaction;

13 receiving a message over the quasi-public network
14 from the identified buyer, said buyer's message
15 indicating acceptance or refusal of the transaction;

16 if the buyer's message indicates approval of the
17 transaction, communicating to an agent of the seller via
18 a secure communication channel information for permitting
19 the buyer to pay for transaction;

20 receiving an authorization code from the seller's
21 agent via said secure communication channels; and

22 sending a cryptographically-signed message including
23 the authorization code to the seller via the quasi-public
24 network.

25 2. The method of claim 1 further comprising the
26 step of:

27 connecting a computer system to the quasi-public
28 network, said computer system having a means for sending
29 and receiving messages.

30 3. The method of claim 1 in which the
31 cryptographically-signed message utilizes public key
32 cryptography.

33 4. The method of claim 1 further comprising the
34 steps of:

1 cryptographically-encoding the authorization code;
2 and
3 attaching said cryptographically-encoded
4 authorization code to the message to the seller.

5 5. The method of claim 1 in which the message
6 received over the quasi-public network from a qualified
7 seller is an e-mail message.

8 6. The method of claim 1 in which the message sent
9 over the quasi-public network to the identified buyer is
10 an e-mail message.

11 7. The method of claim 1 in which the message
12 received over the quasi-public network from the
13 identified buyer is an e-mail message.

14 8. The method of claim 1 in which the message sent
15 over the quasi-public network to the seller is an e-mail
16 message.

17 9. The method of claim 1 in which the quasi-public
18 message is the Internet.

19 10. The method of claim 1 further comprising the
20 step of:
21 qualifying users of the quasi-public network as
22 sellers.

23 11. The method of claim 1 further comprising the
24 step of:
25 maintaining a database of account holders who are
26 users of the quasi-public network.

27 12. The method of claim 11 in which said database
28 includes information regarding account holders who are

1 qualified as sellers and account holders who are not
2 qualified as sellers.

3 13. The method of claim 11 in which the database
4 includes information indicating whether an account holder
5 is qualified as a seller.

6 14. The method of claim 1 further comprising the
7 step of maintaining a first system and a second system,
8 said first system comprising communication
9 accessible to the quasi-public network, and
10 said second system comprising communication
11 accessible to sellers' agents who interface with a
12 bankcard processing network, and further in which said
13 method further comprises the step of:
14 communicating information regarding the
15 transaction from the first system to the second system,
16 after approval by the buyer of the transaction.

17 15. The method of claim 1 further comprising the
18 step of maintaining a first system and a second system,
19 said first system comprising a first database
20 of account holders, said account holders being users of
21 the quasi-public network and including a first group of
22 account holders who are qualified as sellers and a second
23 group of account holders who are not qualified as
24 sellers, and
25 said second system comprising a second database
26 of said account holders including information associated
27 with said second group of account holders including means
28 by which payment can be made by said second group of
29 account holders.

30 16. The method of claim 15 further comprising the
31 step of maintaining a firewall between said first system
32 and said second system

1 17. The method of claim 1 in which communication
2 between the first system and the second system is by
3 batch processing.

4 18. The method of claim 1 in which the transaction
5 is for goods or services provided by the seller to the
6 buyer.

7 19. A method of operating a system that enables a
8 seller and a buyer communicating over a quasi-public
9 network to enter into a commercial transaction involving
10 a payment of funds by the buyer for goods or services of
11 value provided by the seller to the buyer, said method
12 comprising the steps of:

13 qualifying a first group of users of the quasi-
14 public network as sellers;

15 maintaining bankcard payment information for a
16 second group of users of the quasi-public network, said
17 bankcard payment information maintained on a storage
18 medium in a secure portion of a computer system;

19 maintaining listings of said first and second groups
20 of users on a storage medium that is located in a portion
21 of said computer system that has access to the quasi-
22 public network, but that is isolated from the secure
23 portion of the computer system;

24 in response to a message over the quasi-public
25 network from a user of the first group identifying a
26 potential transaction with a user of the second group,
27 sending a message over the quasi-public network to the
28 identified user of the second group for confirmation;

29 upon receipt of a message over the quasi-public
30 network from the user of the second group confirming the
31 transaction with the user of the first group,
32 communicating bankcard information over secure channels
33 to an agent of the user of the first group;

1 upon receipt of an authorization code from the agent
2 via secure channels, cryptographically signing the
3 authorization code; and
4 sending the authorization code to the user of the
5 first group via the quasi-public network.

6 20. The method of claim 19 further comprising the
7 step of:
8 receiving authorization from said first group of
9 users to act as said agent.

10 21. The method of claim 20 further wherein said
11 authorization code is generated by said system.

12 22. A system for enabling commerce among users on a
13 quasi-public computer network, comprising:

14 means for sending and receiving messages to users on
15 the quasi-public network;

16 means for identifying users who are qualified as
17 sellers;

18 means for identifying messages received from users
19 who are qualified as sellers;

20 means for generating messages to users who are
21 buyers identified in the messages received from the
22 qualified sellers requesting confirmation of transactions
23 between said users who are sellers and said users who are
24 buyers;

25 means for identifying messages from the buyers
26 indicating confirmation of the transactions;

27 means for isolating the sending and receiving of
28 messages to and from users from financial information
29 associated with said users who are buyers for settling
30 financial transactions;

31 means for sending financial information associated
32 with buyers via secure channels to agents of sellers
33 relative to confirmed transactions;

1 means for receiving authorization codes from the
2 sellers' agents;
3 means for cryptographically signing the
4 authorization codes; and
5 means for generating messages to the sellers
6 including the cryptographically encoded authorization
7 codes.

8 23. A method of operating a computer system to
9 enable users of a quasi-public network to initiate a
10 commercial transaction involving a payment of funds by
11 one user of the quasi-public network to another user of
12 the quasi-public network, the method comprising the steps
13 of:

14 maintaining a listing of users of the quasi-public
15 network who are qualified to function as sellers;

16 operating a computer system that is connected to the
17 quasi-public network, said computer system having a means
18 for sending and receiving messages from users of the
19 quasi-public network;

20 upon receipt of a message over the quasi-public
21 network from a first user of the quasi-public network,
22 said first user being qualified to function as a seller,
23 sending a message over the quasi-public network to a
24 second user of the quasi-public network, said second user
25 being identified in the message from the first user, said
26 message being sent to the second user including a request
27 to confirm a transaction identified in the message
28 received from the first user;

29 upon receipt of a confirmation of the transaction
30 from the second user, forwarding payment information of
31 the second user to an agent of the first user; and

32 upon receipt of an authorization code from the
33 agent, encrypting the authorization code and sending the
34 authorization code to the first user.

1 24. A payment system for use with the Internet
2 comprising:
3 qualifying a user as a seller;
4 receiving a message via the Internet from the
5 qualified seller regarding a transaction with a buyer
6 that identifies at least an account identification of the
7 buyer, said account identification maintained by the
8 system;
9 requesting confirmation of the transaction from the
10 buyer by communicating a message to the buyer via the
11 Internet;
12 upon receiving confirmation from the buyer of the
13 transaction from the buyer via the Internet;
14 sending a message off the Internet to an agent of
15 the seller, said message containing information relating
16 to the transaction and payment information for the buyer;
17 receiving confirmation of the transaction from the
18 seller's agent; and
19 communicating an authorization code to the seller.

20 25. The method of claim 24 further comprising the
21 step of:
22 obtaining authorization from said seller to act as
23 an agent therefor.

24 26. The method of claim 25 further comprising the
25 steps of:
26 confirming the transaction and payment information
27 as seller's agent; and
28 generating said confirmation as seller's agent.

29 27. The method of claim 24 further comprising the
30 step of cryptographically signing a message including the
31 authorization code communicated to the seller.

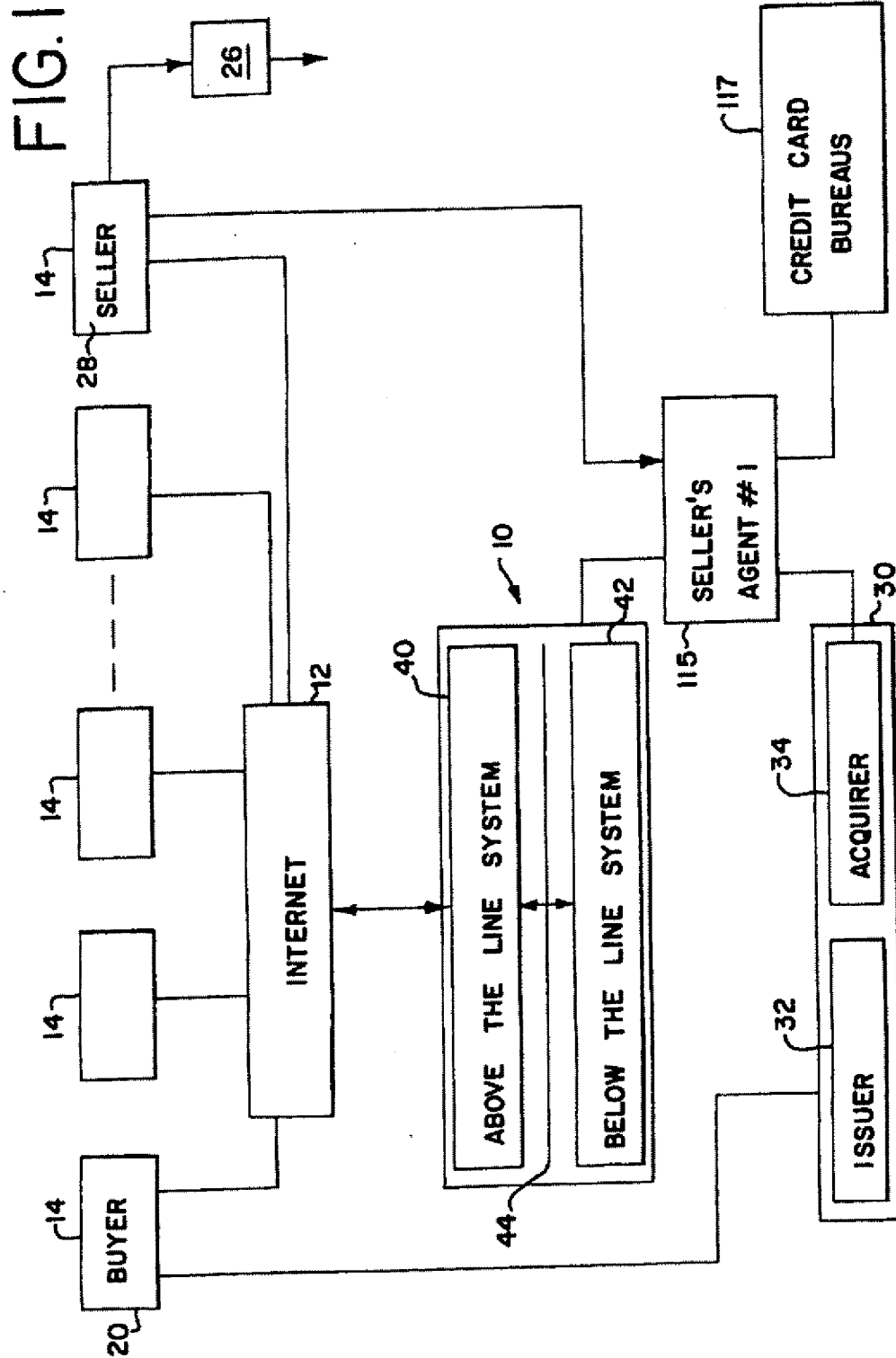
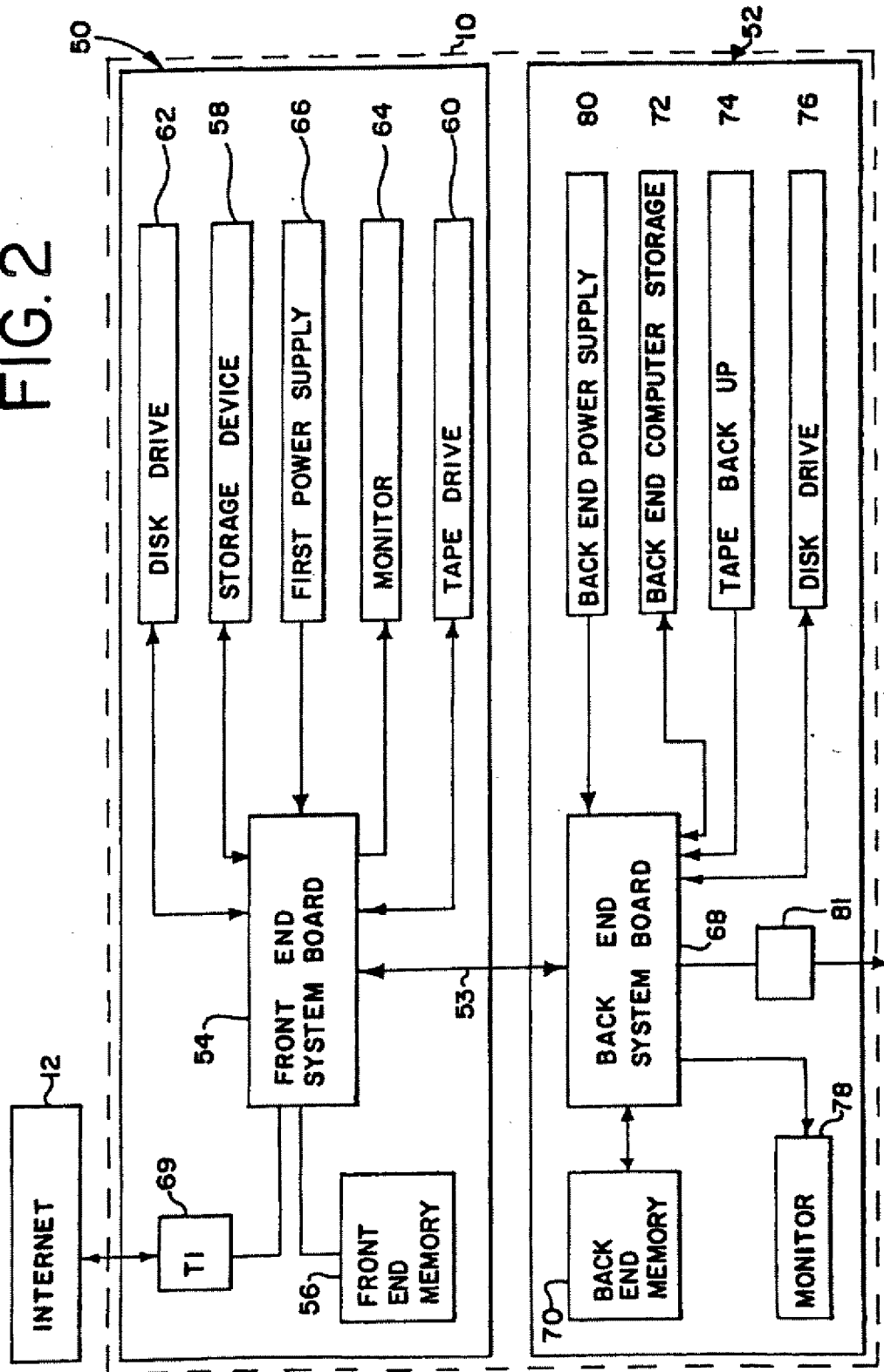


FIG. 2



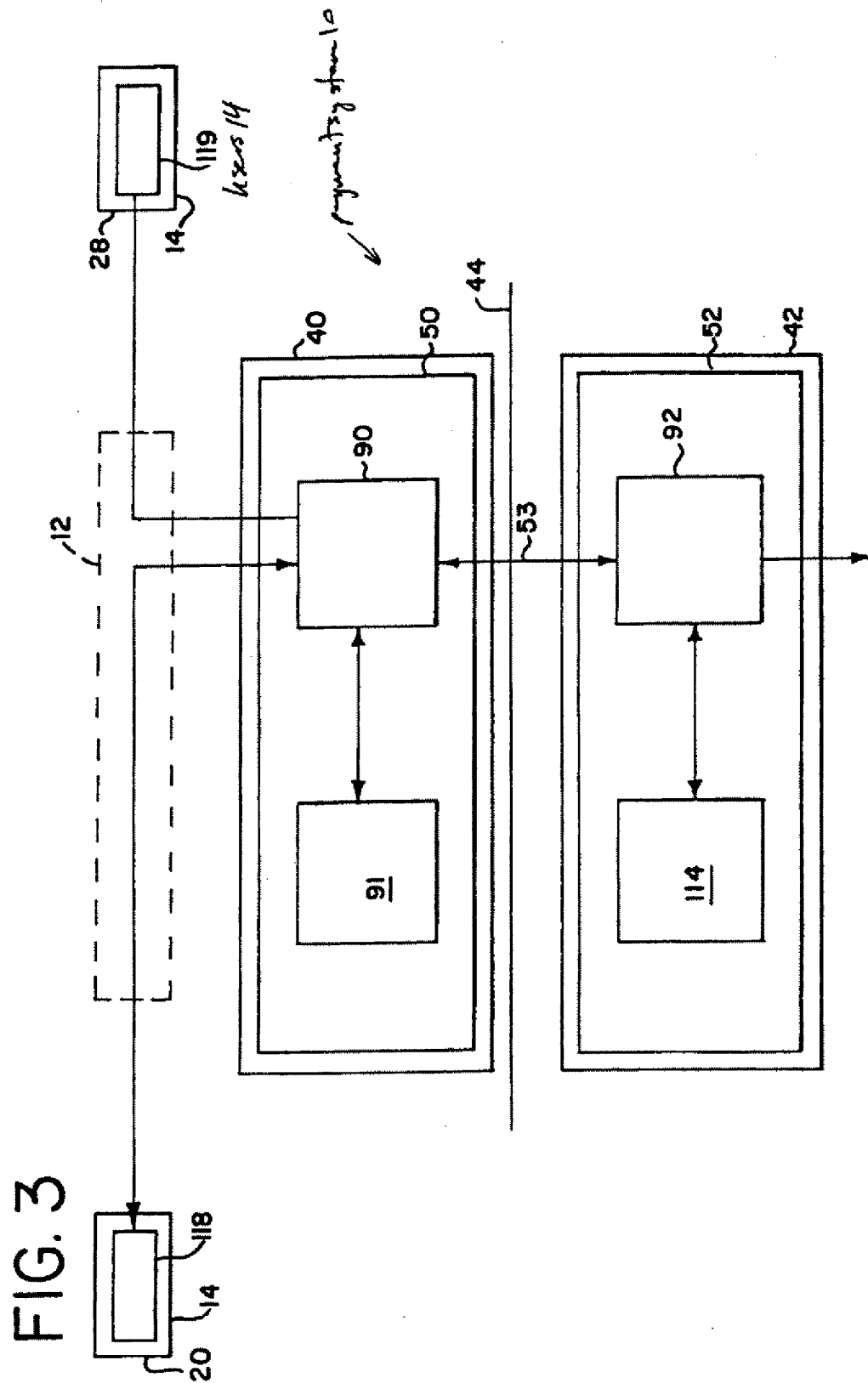


FIG. 4A

100

CARD HOLDER ACCOUNT	
CARD NUMBER	102
NAME	103
INTERNET ELECTRONIC ADDRESS	104
STATE	106
PAY-IN SELECTION	108
<div style="border-top: 1px dashed black; height: 20px;"></div>	

FIG. 4B

200

SELLER'S ACCOUNT	
CARD NUMBER	202
NAME	203
INTERNET ELECTRONIC ADDRESS	204
STATE	206
SELLER'S AGENT	219
<div style="border-top: 1px dashed black; height: 20px;"></div>	

FIG. 5

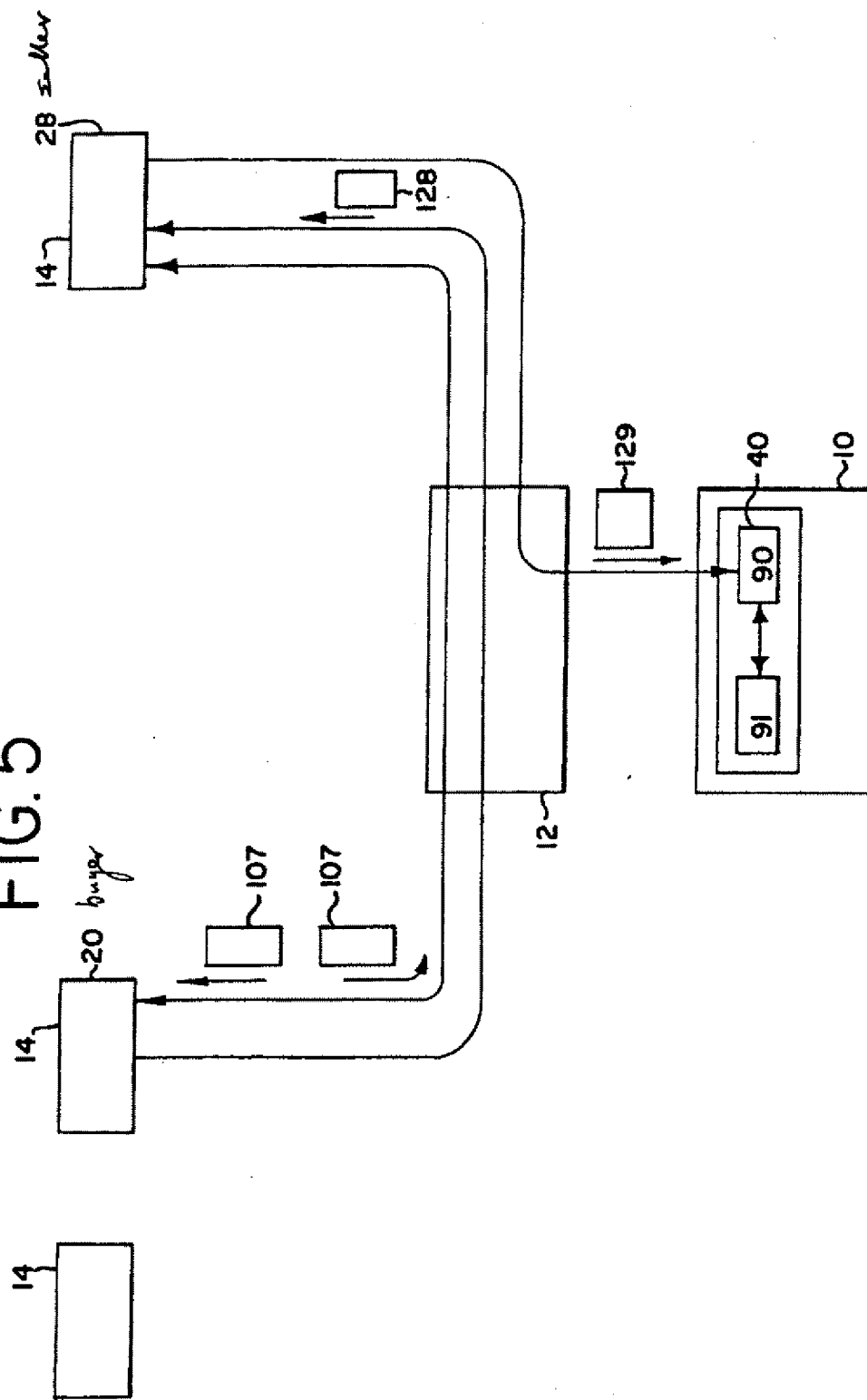


FIG. 6A

102	

128

FIG. 6B

PAYMENT - REQUEST	
102	
202	
232	
234	
236	
237	

129

FIG. 6C

PAYMENT - QUERY	
142	
103	
203	
232	
235	

140

FIG. 6D

PAYMENT - RESPONSE	
142	
152	

150

FIG. 6E

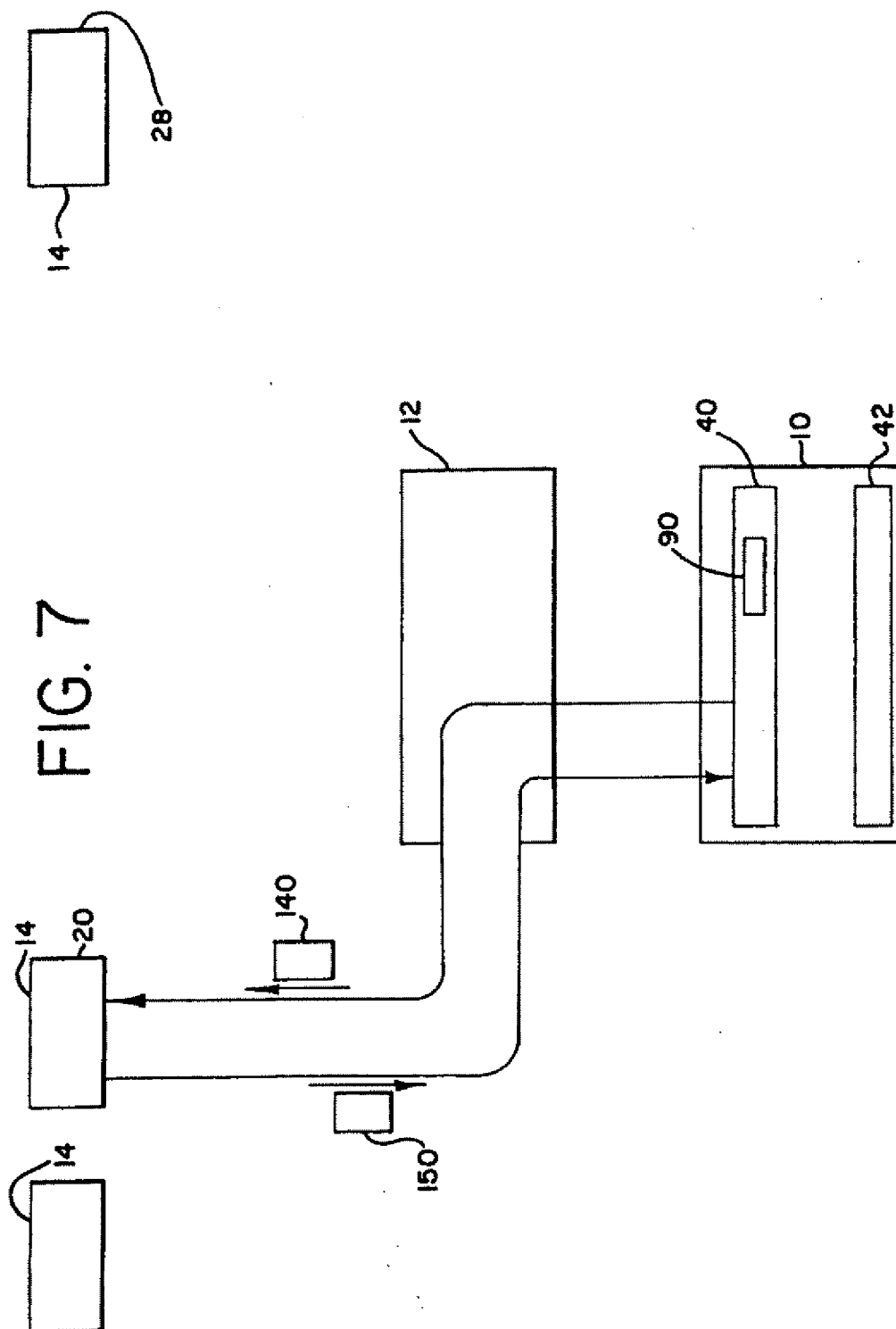
PAYMENT - RESULT	
142	
203	
103	
232	
152	
236	
234	

160

FIG. 6F

PAYMENT - NOTIFICATION	
236	
262	

264



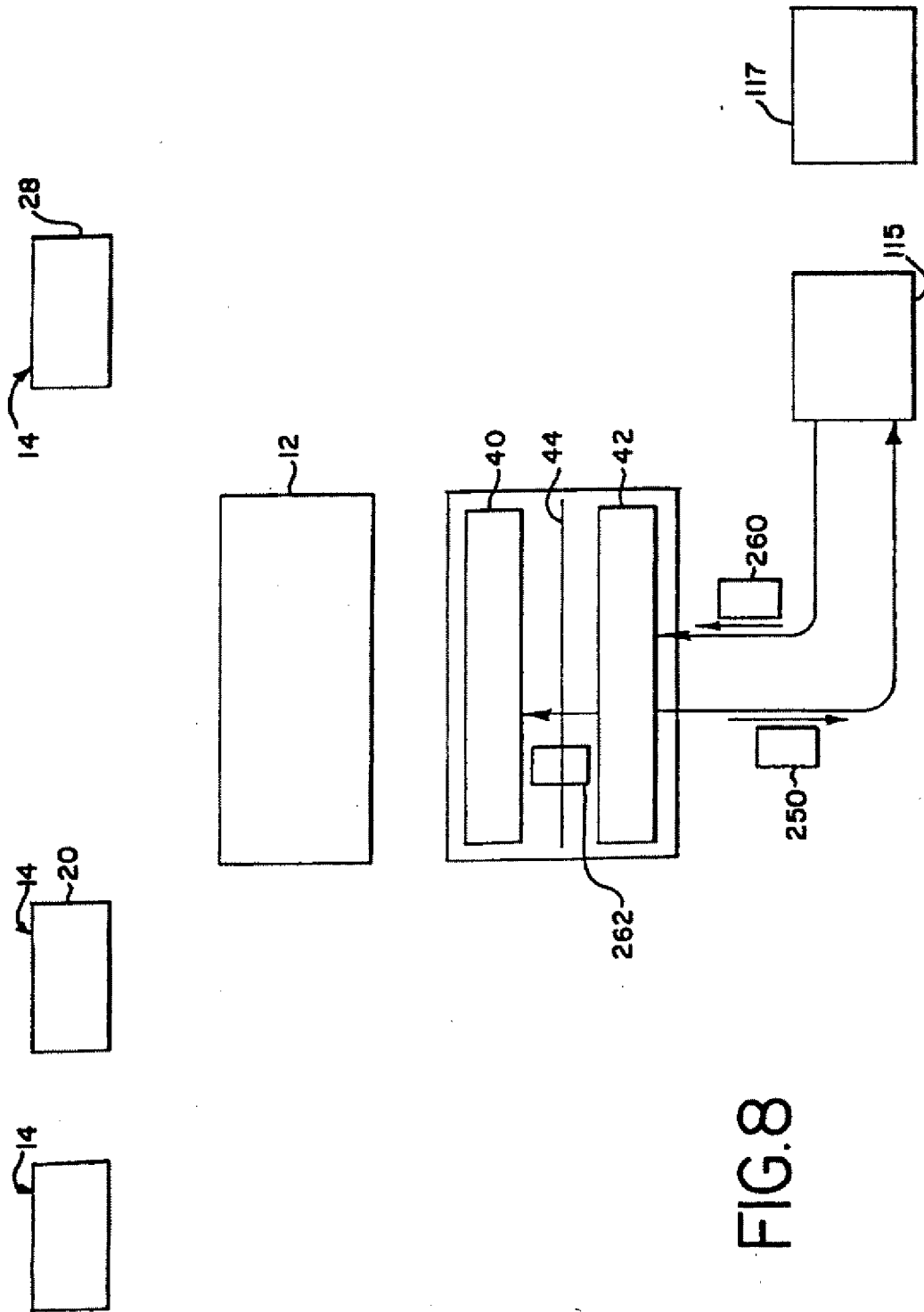


FIG. 8

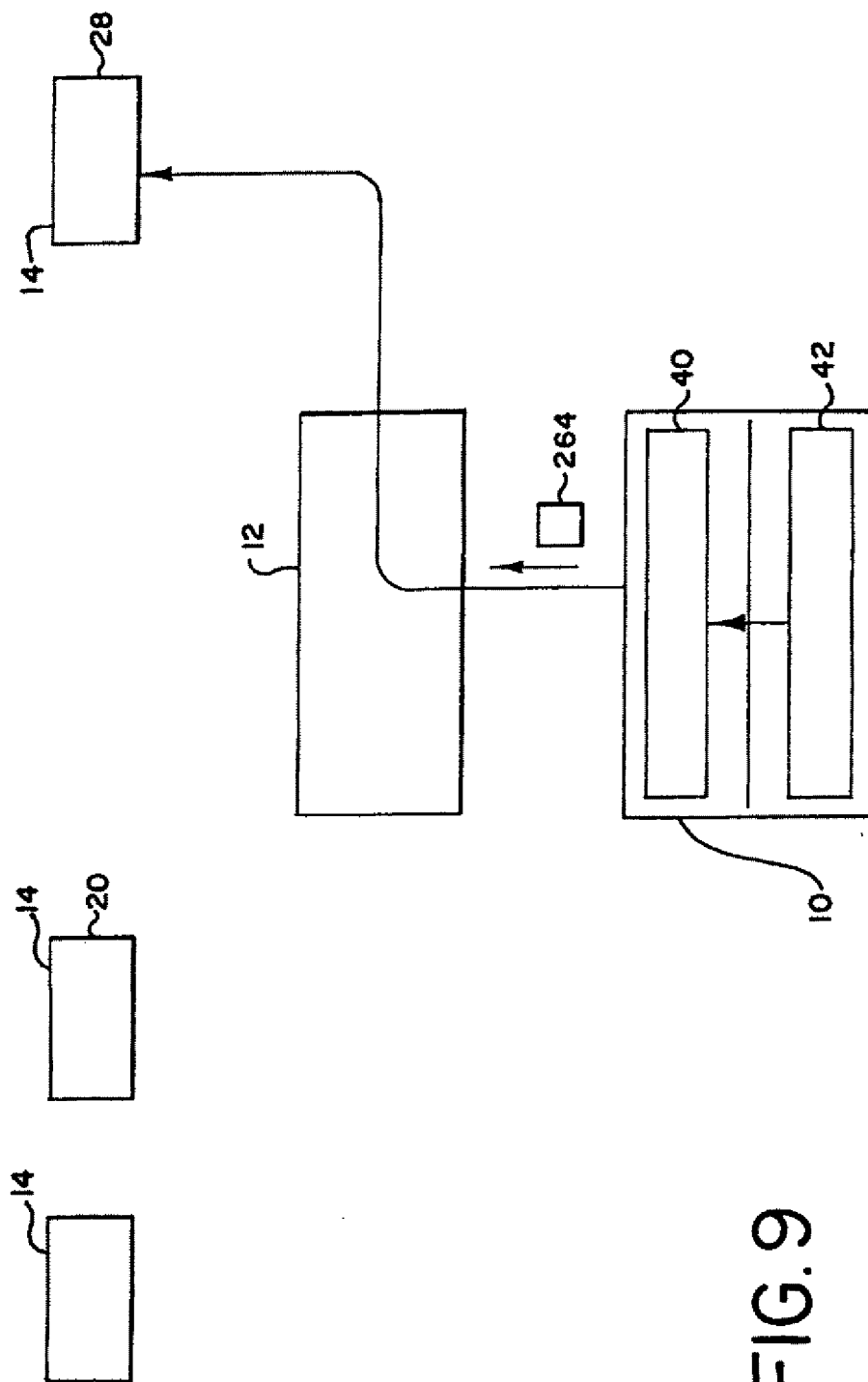


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/17556**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : H04K 1/00

US CL : 380/24,49; 395/226

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 380/23,24,25,30,49; 395/226,227,237,238,239,242,244; 364/400

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS search terms: Firewall, Advertising, Secure communications

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,E	US 5,590,197 A (CHEN et al.) 31 December 1996, entire document.	1-27
X ---- A	US 5,329,589 A (FRASER et al.) 12 July 1994; Abstract, Figure 4, column 8 line 5 - column 9 line 55 and the claims ----- rest of document	23-27 ----- 1-22
X	Press Release for "CARI" and "Frequently asked Questions about CARI", 10 April 1995; entire document See FAQ #18	1-27

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	The NetBill Electronic Commerce Project, 15 May 1995; Sections entitled "The NetBill Transaction Protocol" and "NetBill Costs and Interaction with Financial Institutions" and SANTO, B. Bill paying put on line, Electronic Engineering Times no 849, page 82, 20 March 1995	1-27
X	The GlobeID Payment System, Spring 1994 (3 pages)	1-13 and 18-27
A	US 5,283,829 A (ANDERSON) 01 February 1994.	1-27
A	US 4,947,028 A (GOROG) 07 August 1990; details of order payment system.	1-27
A	US 5,420,926 A (LOW et al.) 30 May 1995.	1-27
A	US 5,291,554 A (MORALES) 01 March 1994.	1-27
A	US 4,799,156 A (SHAVIT et al.) 17 January 1979; particularly, figures 2, 14, and 15; columns 1-2, column 6 lines 1-15, column 8 lines 15-22, column 8 line 55 - end of column 9, and column 15.	1-27
A,P	US 5,557,518 A (ROSEN) 17 September 1996, figures 1,5, 12, 29, and 43; cols 1 and 2, col 6 lines 44-end, column 7 lines 22-34, column 10 lines 27-32, column 23 lines 9-51, column 24 lines 7-10, column 28 lines 8-37, and claims 1,6, and 7.	1-27